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Probe-probe Method for Measuring Dephasing Time in Saturable Absorbing Materials,* D.J. ERSKINE, A. BELLO, H.B. RADOUSKY, S. FOCHS and M. PERRY, Lawrence Livermore National Laboratory,--For a saturable absorbing material being measured in transmission by a pair of subpicosecond optical pulses the dephasing time T_θ can be thought of as the time it takes for the material to "forget" the polarization of the first pulse. The dephasing time can be longer or shorter than the saturable absorption relaxation time T_R which governs the decay of level population irrespective of polarization interaction. For example, in a dye dissolved in a fluid such as malachite green in ethylene glycol, T_θ is controlled by the picosecond molecular rotational diffusion time of the fluid, and this is much longer than picosecond value of T_R . In semiconductors $T_\theta < T_R$ generally, controlled by the momentum scattering rate versus energy scattering rate for carriers. We introduce a general technique for measuring T_θ/T_R by comparing the height of transmission correlation peaks obtained by cross and parallel polarization configurations in probe-probe¹ experiments. We have measured T_θ/T_R in GaAs to be approximately 0.3. The technique can be applied to a general saturable absorber. The advantage of the technique is that the measurement can be obtained even when T_R and T_θ are shorter than the laser pulse width.

¹A.J. Taylor, D.J. Erskine and C.L. Tang, J. Opt. Soc. Am. B 2, 663 (1985).

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